



Kubernetes

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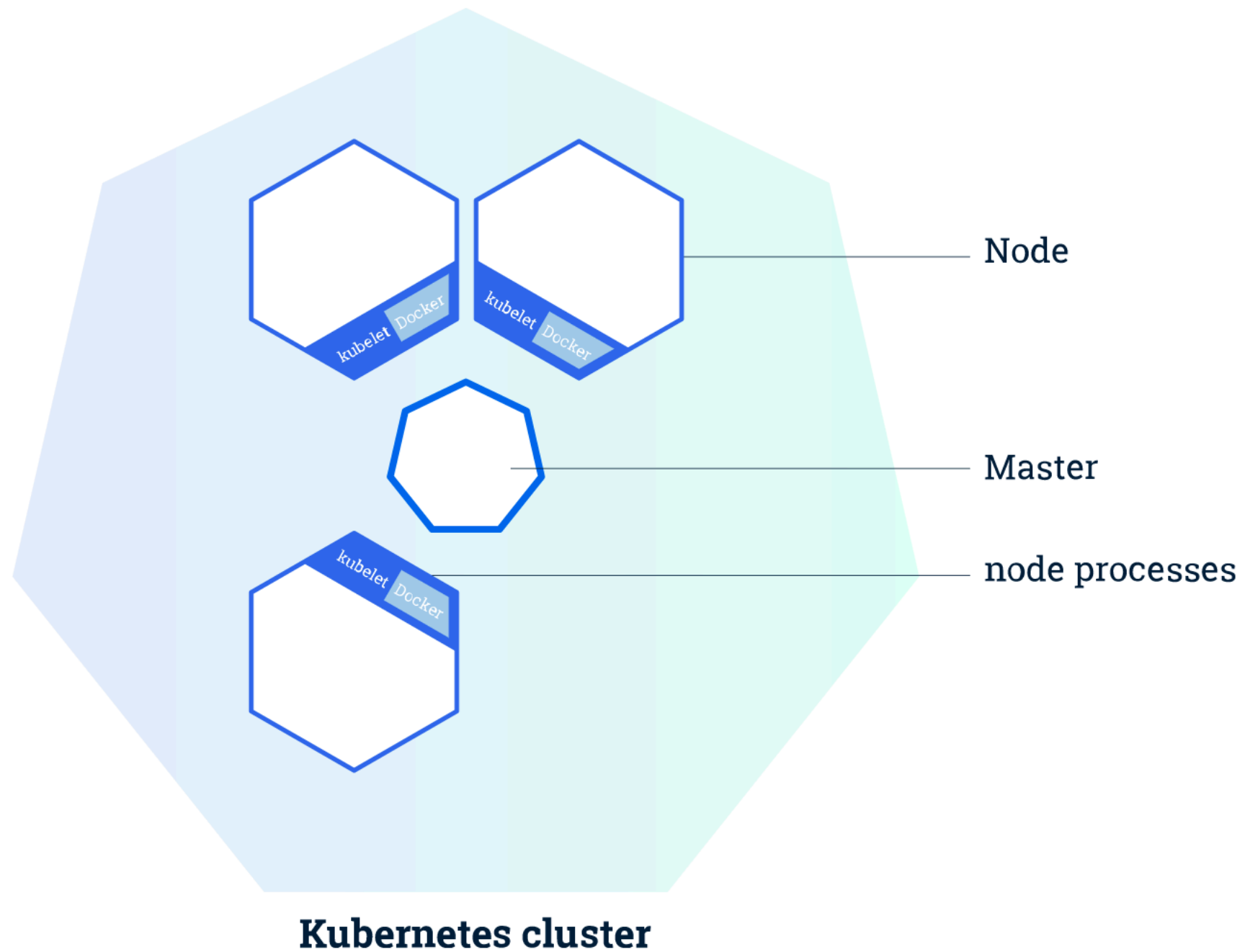
In the Beginning...

- If you managed dozens of VMs now think about managing *thousands* of VMs.
- Need tools which detects failures, spread load across machines, manages memory, other resources for cluster.
- Need
 - isolation: One compute unit shouldn't take down another. or Starve.
 - scheduling: detect & replace failures.
 - orchestration: well balanced resources to distribute load, high utilization
- Big job beyond Chef, Puppet, Ansible etc. (configuration management tools), Good old ssh and running scripts.

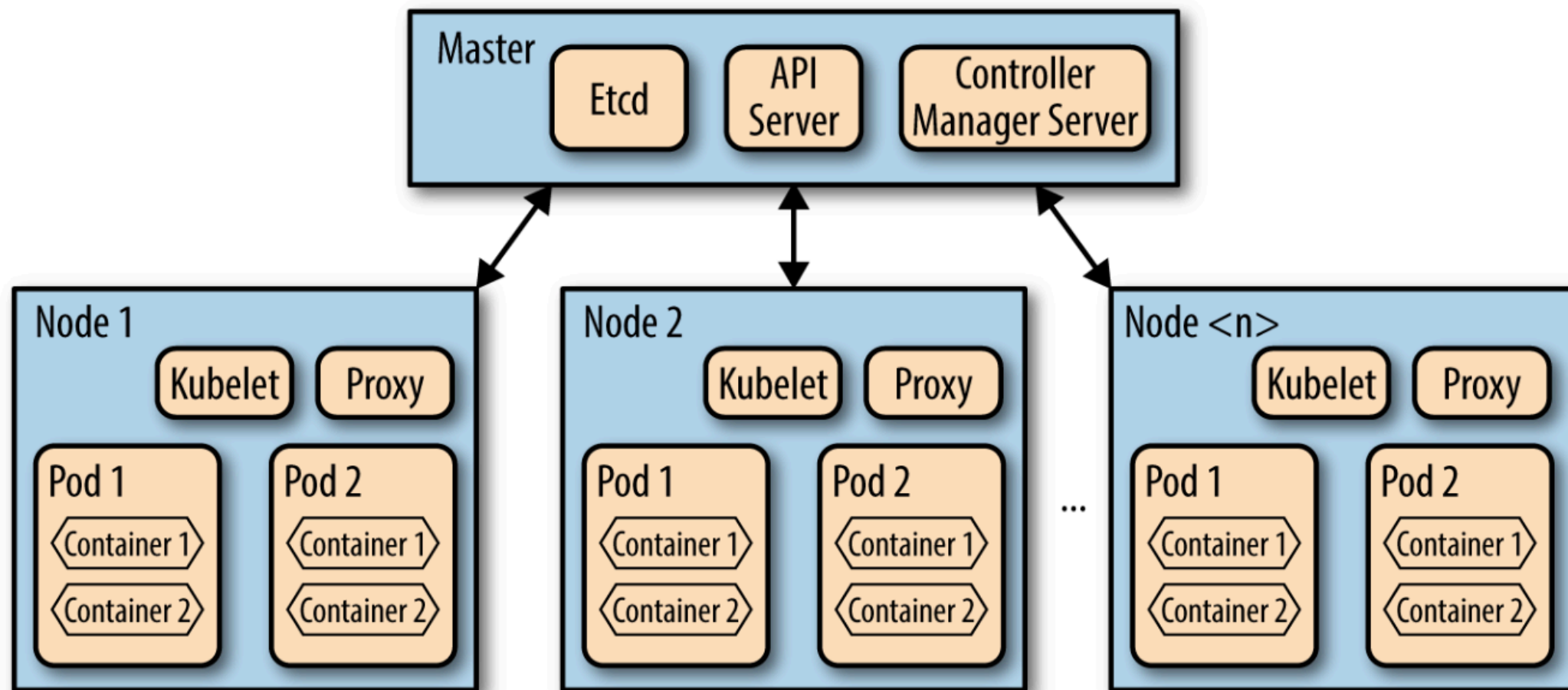
Go Big or Go Home...

- Google's Borg:
 - Production grade container management & scheduling
 - When Docker came along in 2013, Google decided to open source most useful bits of Borg - Kubernetes
 - Builds on decade and half of Google's experience.
 - <https://research.google.com/pubs/pub43438.html>

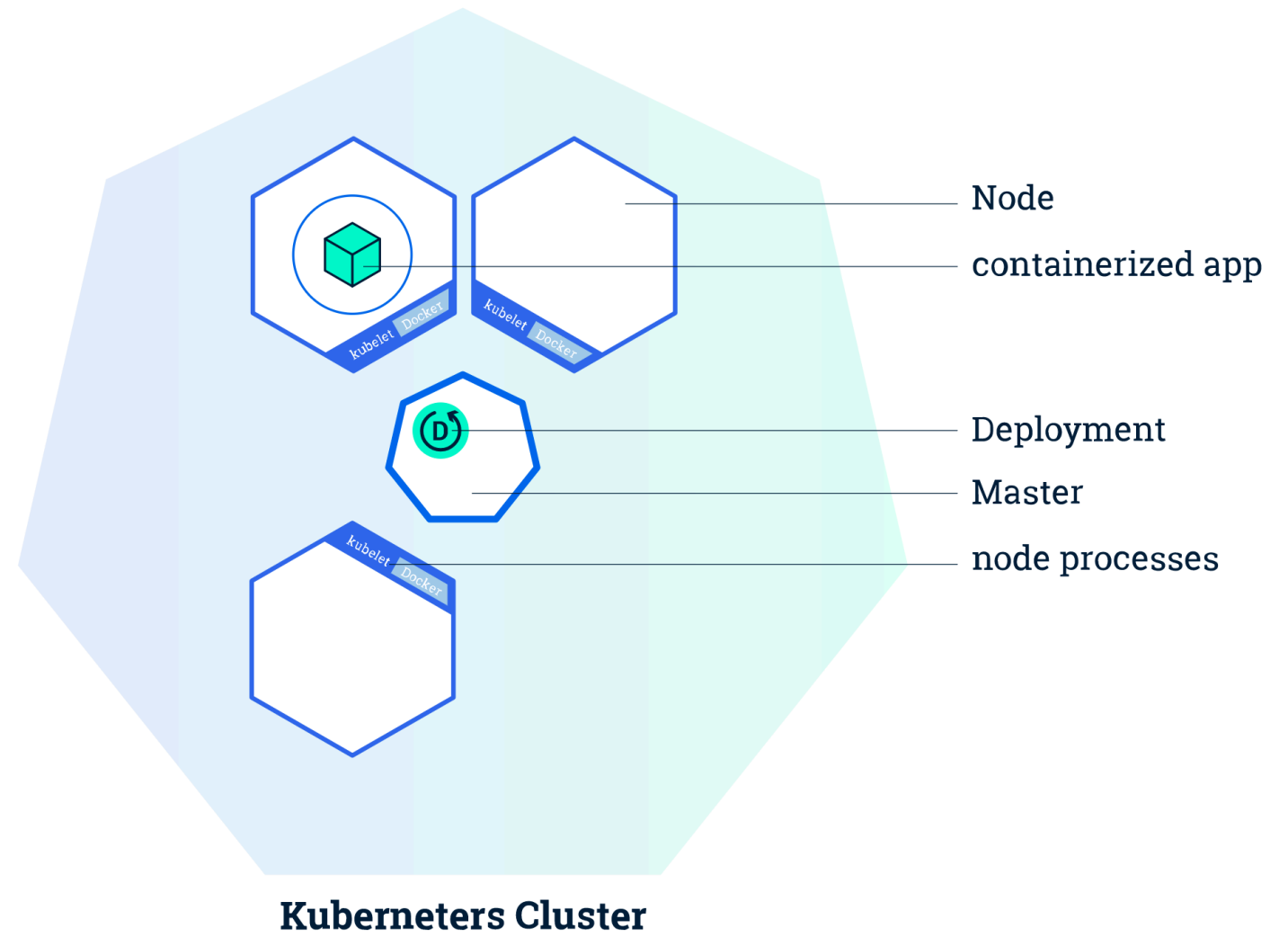
Master is
coordinating
software:
scheduling
containers on
Nodes



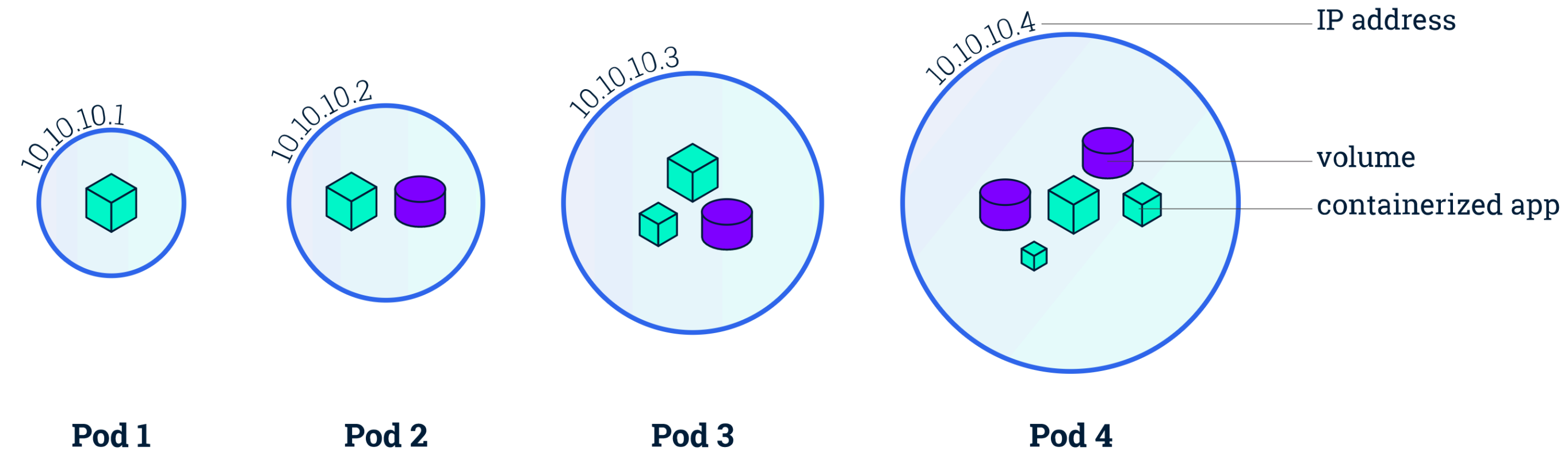
Kubernetes expanded



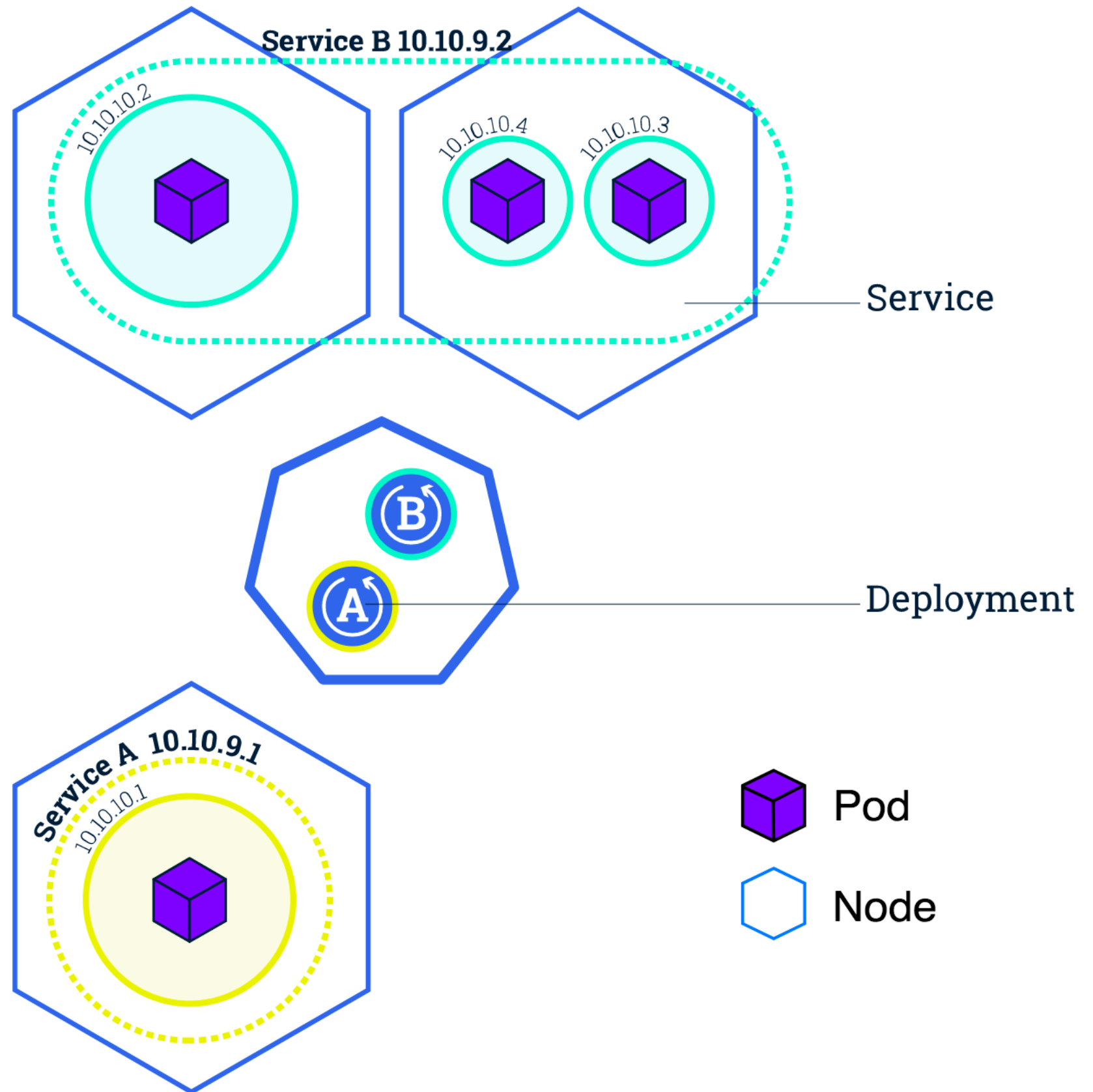
Deployment

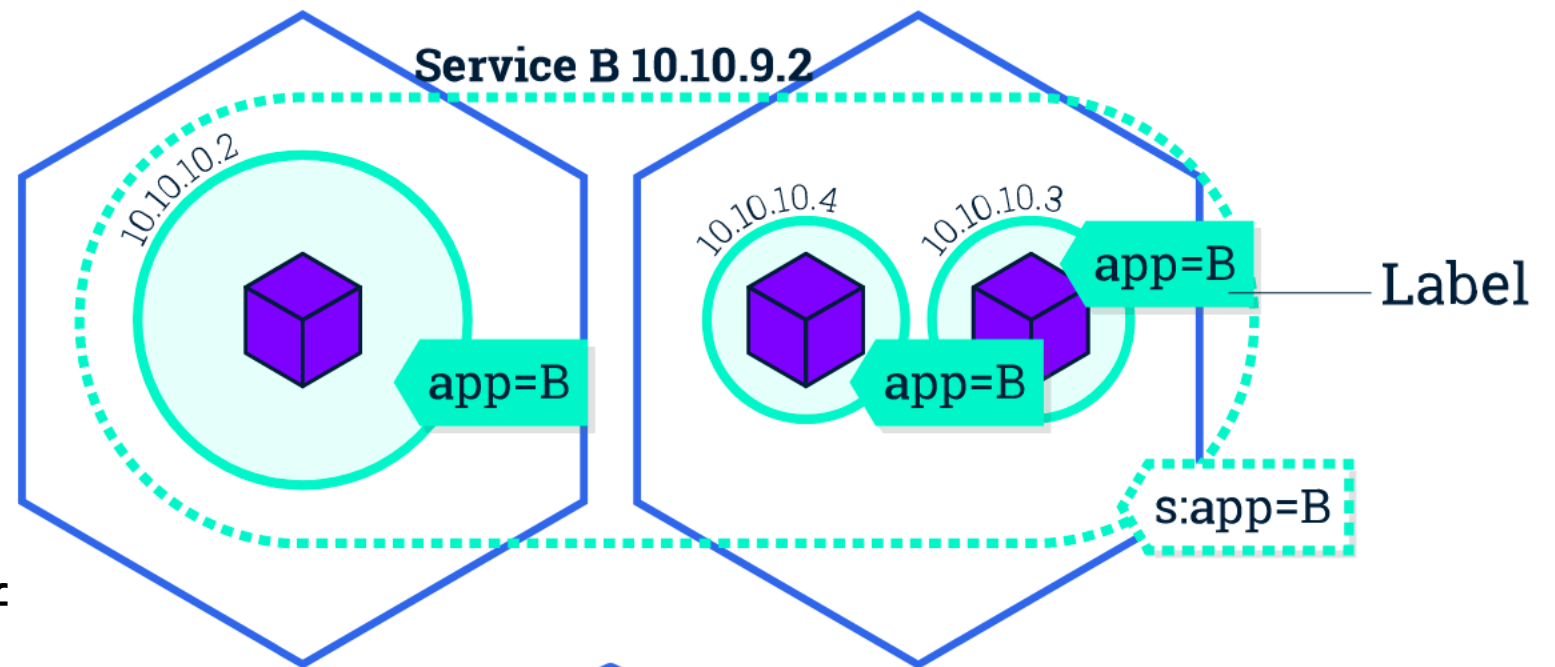


Pods: deployment creates pods



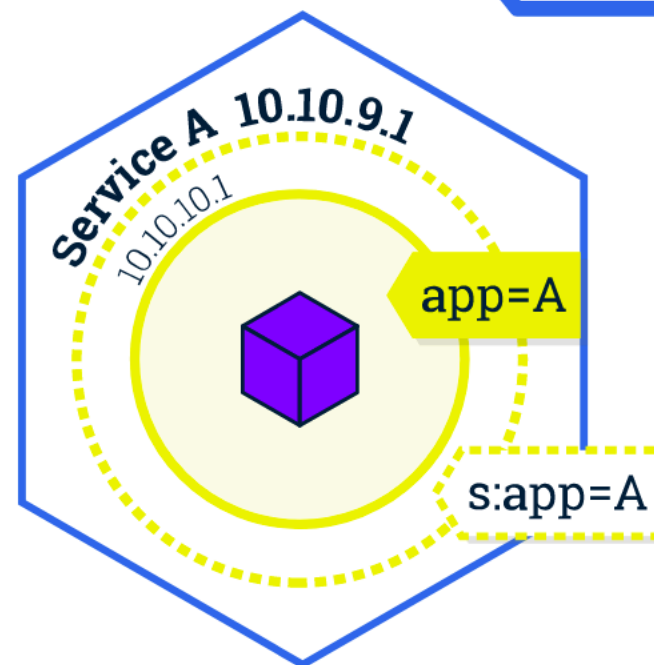
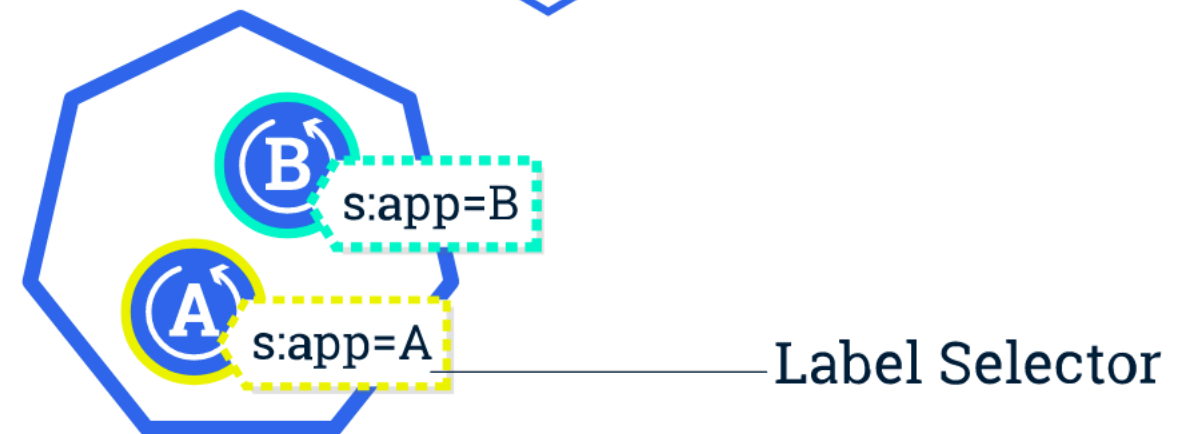
Services:
Abstraction which
define logical sets
of Pods, and a
policy by which to
access them.

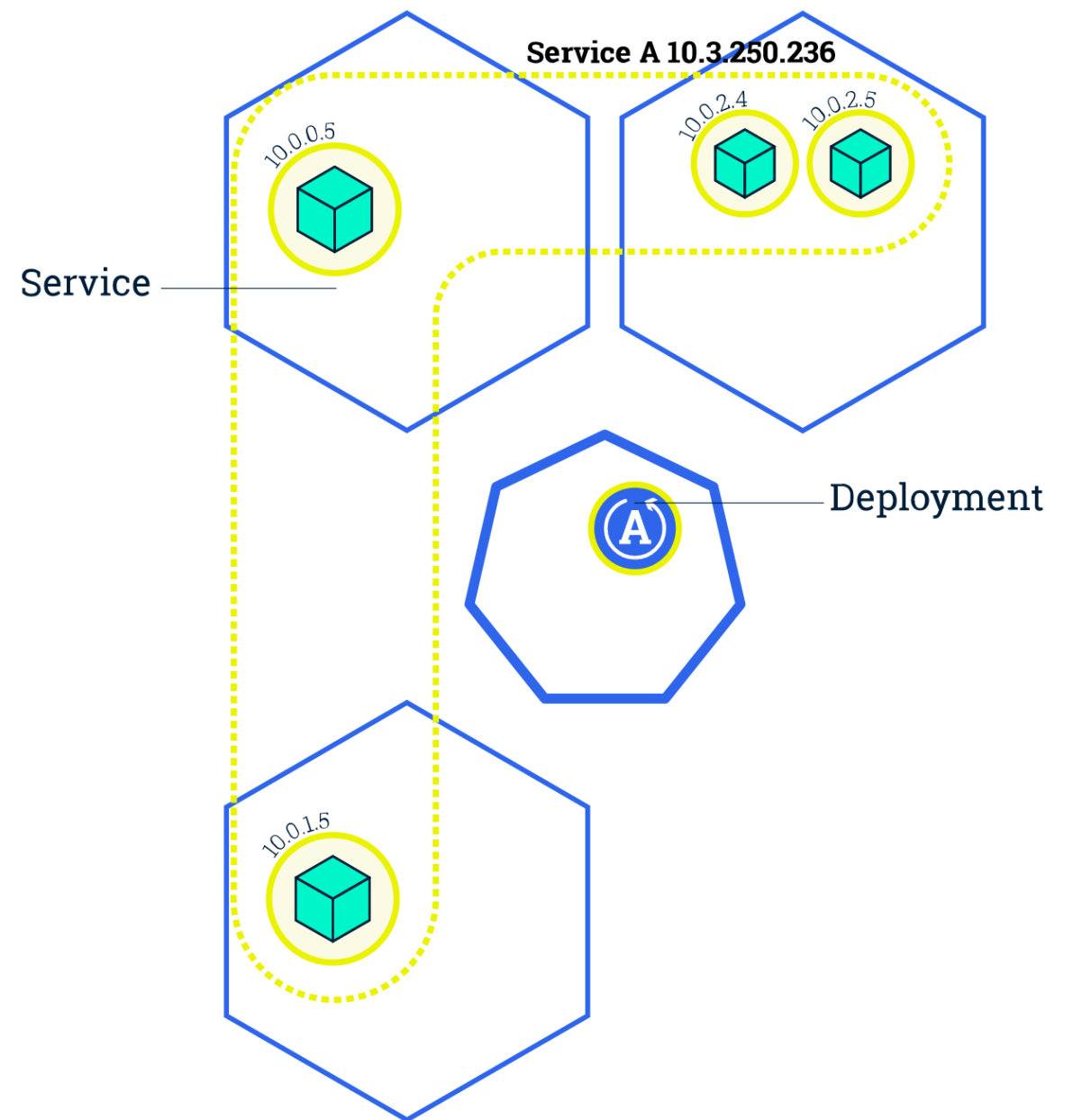
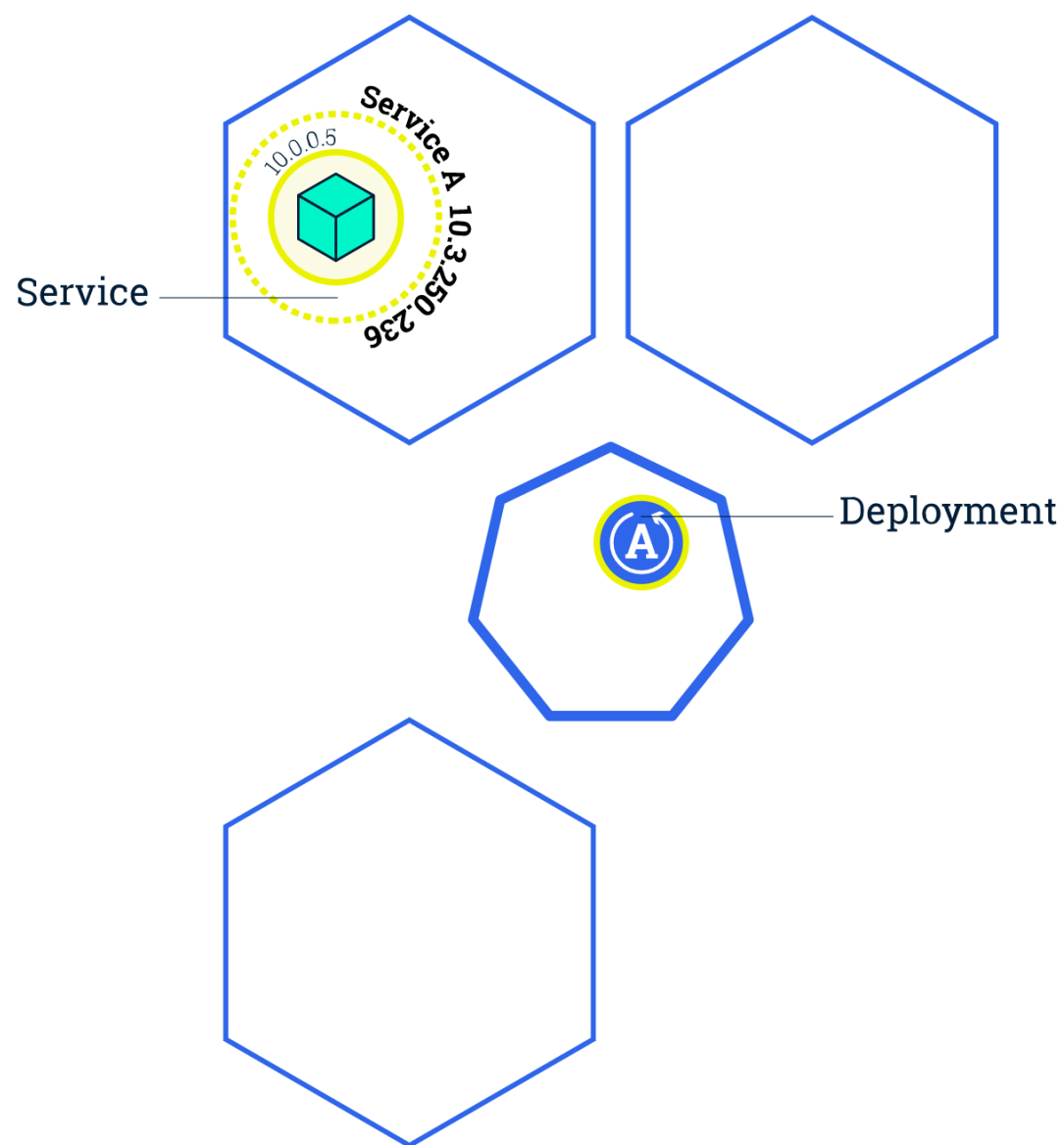




How Services match set of Pods?

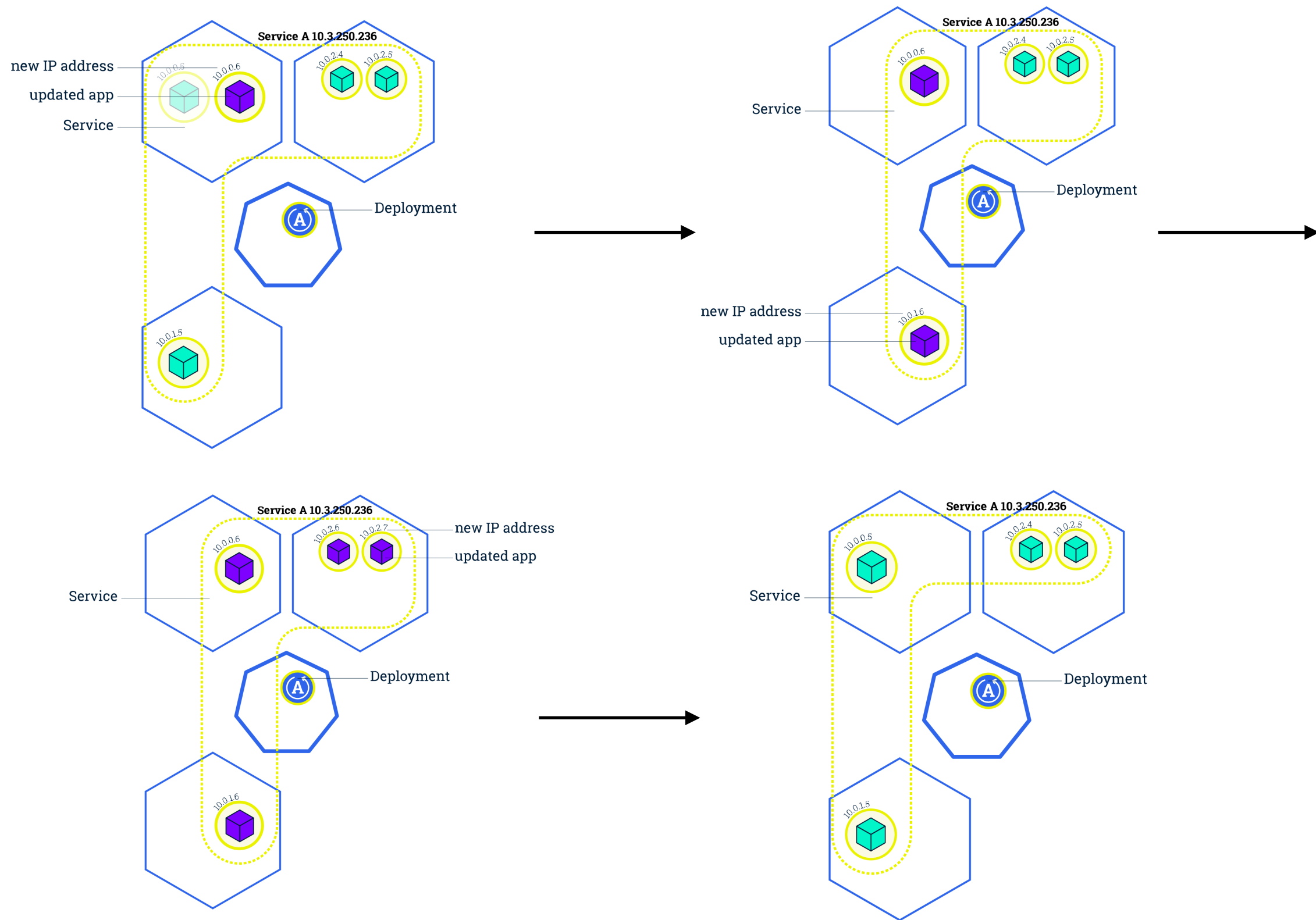
- Using selectors: Which are Labels: Labels key/value pairs
- Labels can be attached to objects anytime, can be updated anytime.





Scaling

Kubernetes also supports autoscaling



Rolling Updates: Deployment update with zero downtime!

- Incremental update: By default max unavailable pod and max new pod is one.
- can be reverted to previous stable version.

Demo on Google Container Engine

- Create a Cluster
- Deploy an App
- Expose app as Service
- Scale app
- Update app
- Rollback deployment

Running Kubernetes locally during development

- Install kubectl
- Install minikube: <https://kubernetes.io/docs/getting-started-guides/minikube/>
- “minikube start”
 - Sets up 1 Node cluster.
 - launches VM and setups to kubectl to point to Master API in one node cluster.

Cool stuff, but whats the cost?

Research at Cornell University:

Motivation: Although containers tout low overhead performance, do they still have low energy consumption?

How does Docker affect energy consumption? Evaluating workloads in and out of Docker containers (2nd May <https://arxiv.org/abs/1705.01176?context=cs.PF>)

Results: In all cases, there was a statistically significant increase in energy consumption when running tests in Docker, mostly due to the performance of I/O system calls.

Cluster Federation in Kubernetes

Cluster of Clusters “Ubernetes”

Thank you.

References:

- Some slides contents from Book: Scaling the Future at Cloud Scale
- Pictures from : <https://kubernetes.io/docs/tutorials/>